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FISHES: WHY STUDY THEM?

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THE PHILIPPINE BUREAU OF SCIENCE

WHY should any one study or want to study fish? Perhaps every man who is not a lounge lizard or a confirmed valetudinarian, certainly every boy, to say nothing of many girls and women, likes to escape from the trammels of every-day life and the suffocating indoor artificialities of cities and go a-fishing. Whether it is the outdoor freedom, the lure of stream or forest, mountains or the sea, or the joy of hauling in the big fellows, the fish or the fun of fishing, we must leave to each individual to determine. At any rate few despise the after period of rest and reminiscence, when crisp trout or flaky black bass, salmon bake or Spanish mackerel *aux fines herbes*, refresh and fortify against the next day's adventures.

But to spend most of the year swapping fish yarns and overhauling tackle and the rest of the time trying to catch fish is not studying fish, although the true "compleat Angler" does really and truly study fish.

The number of people who are interested in fish in one way or another is very great, in some countries including the total population, while in countries like the United States it is far greater than one realizes. Yet, like some other things of primary economic importance very few people really know anything about fish, and still fewer make a thorough study of them, though many people are vitally interested in some economic aspect of fishes.

From the earliest times man has undoubtedly eaten fish whenever he could get any, and with the spread of mankind many ingenious devices were invented for their capture, long before the dawn of any existing historical records. Since fish cost nothing to breed or maintain, and since in many regions they came periodically in uncountable numbers, many groups of people, especially in cold climates, came to depend upon them as their most important food. In other regions, such as the low coastal plains of Asia and the islands adjacent, fish became the most important source of protein food.

Although at first a purely utilitarian proposition, fishing, like hunting, with the advent of organized society came to be a recognized sport many thousands of years ago.

Very early in the historical period far-seeing men in regions like Egypt or China began to develop the artificial culture of fresh-water fish to supplement the food supply of a rapidly increasing population. In like manner the people of Java, the Philippines, Formosa and Hawaii developed systems of pond culture for certain marine fishes. Their methods are still in use and consist in catching the newly hatched fry in the rivers or sea and transferring them to ponds where they are kept till large enough for market, herbivorous fishes only being reared.

Before the dawn of history people had also learned to dry fish both with and without the use of salt, and to cure them by smoke. Later came such processes as pickling in brine, or with the use of vinegar or spices.

With the advent of Christianity into northern Europe and the subsequent change from savagery to civilization, fish and fisheries became increasingly important and many regions arose from nothing because of their control of the production or distribution of fish. We may trace the rise of modern Holland to her development of a special method of preparing herring.

As population increased and certain countries turned their attention more and more to foreign trade, valuable fishing grounds came to be in great demand, and regions like the Grand Banks were a matter for statesmen and diplomats and fleets to struggle over.

In primitive society only a small proportion of the total quantity of fish was taken and the balance of nature was never destroyed. As population increased the additional number of fish required was obtained by improvements in capturing and preserving, while the better organization of society ensured their distribution more evenly and to more remote regions. This greater and slowly increasing call for food continued for centuries without seriously impairing anywhere the sources of supply. It was not until the advent of the modern industrial period and its rapid development that the rivers of regions like England and the North Atlantic coast of our own country began to lose their importance as sources of food supply, and later still when the tremendous increase of factory industries destroyed the swarms of luscious fish which annually visited them.

But it remained for the enormous development of fish canning to practically destroy the annual run of Pacific coast salmon, an industry which rightly handled should have been as permanent as the production of wool or beef.

It is a bitter commentary upon the organization of modern industrialism that, as a rule, the men who are in business know

little or nothing about the thing which they are exploiting. The fish canner was compelled to know something about the processes of canning, often paying very dearly for his knowledge, and he knew more or less about how to sell the finished product, but as for knowing anything about fish—salmon, for instance—his ignorance was incredibly profound. As a result the salmon is, in some of the regions where it was almost unbelievably numerous, practically extinct because the packers not only were entirely ignorant but would not pay any attention to those who did know, and used their political influence to destroy the labor of those who would have made their industry a permanent one.

Another modern method of totally destroying the food supply upon which millions of people depended was exemplified in India, where the construction of dams for irrigation by well-meaning but ignorant politicians and engineers separated fish from their spawning grounds with fatal results. In other regions the taking of water for irrigation at a time when tiny young fishes swarm in the water, without providing in any way for their protection, has destroyed a primary source of food for the common people.

A little fundamental knowledge concerning fish and their life histories and habits would therefore certainly not come amiss to the business man, and would be of great utility to the far-seeing statesman or state executive, whether concerned with problems of food production and conservation, or taxation. Particularly should the latter have some slight modicum of knowledge in order to be able to appreciate the importance of fostering, to say nothing of improving, modern methods of fish culture which have revolutionized the fisheries of both fresh and salt water in many regions.

For a very long time there have been men who studied as best they could the fish life of their region, and since the time of Aristotle we have had more or less trustworthy written accounts of fishes. But the modern study of fishes dates from Artedi, a friend of Linnæus, and since that time a vast literature has arisen, treating of every conceivable topic which is in any possible way related to fishes, their lives, or any relation man sustains to them.

And yet with all this activity the actual number of people who are really engaged in studying fish is very small, and but few schools in the United States offer courses making fish the central or only subject of study. In spite of all that has been done and published, our ignorance of many problems of primary importance, zoologically and economically, is abyssal. For example, in the region in which I am now working, where fish form the principal animal diet of ten million people, we do not know the most elementary facts concerning a single fish in the Archipelago, in

spite of the fact that money spent in obtaining adequate knowledge of say the herring family would be repaid incredibly in advancing the economic and dietetic welfare of the people.

The surface of the world is by now pretty well explored, and there are no new continents or even very large areas of land or water to explore, outside of the polar regions. But enormous areas on a different plane remain to be explored and there is no question but what in time very considerable portions of the oceanic depths and bottom will be studied and the kind and relative abundance of their fishes well known. At the present time our knowledge of many regions is equivalent to that which would be gained by studying the fauna of a continent from samples gained by dragging a basket on a rope hanging from a balloon several miles up in the air. Large active fishes are not likely to be caught in a dredge and there may exist, in regions not too deep, vast numbers of fishes which some day will be known and utilized. Some of them may be known to-day from a few rare, strange examples, others are undoubtedly totally unknown as yet, but with improved methods of deep sea exploration and study man will learn their haunts and habits and be able to capture them in quantity.

Probably more young people become interested in zoology through their observations of birds or butterflies than in any other way, and it is not likely that anything will ever supersede them in beauty or attractiveness.

But a good exhibit of living fish attracts as many people as perhaps any other forms of life and in the tropics at any rate the coral reef fishes are only equalled in beauty and grace of form and color by the humming birds and butterflies. Fish are certainly attractive when living, and their study, whether of living or preserved specimens, can be made equally so if properly presented. It would seem, therefore, that more schools should offer courses where fish are the chief subject rather than merely dismissing them after the study of one or two types.

The zoologist and student of evolution should realize that no other group of vertebrates offers such enormous diversity of structure, form, habitat, habits and development as does that of the fishes, and then they should act on their knowledge.

The ignorance of even comparatively well-informed people about fish is stupendous. This is well illustrated when one tells a fish story. If he tells the plain unvarnished truth about climbing perch, the gobies or blennies that chase insects over the land and which leave the water for safety when you try to catch them, or even about plain ordinary Sangamon river catfish or Cumberland river eels, they put him down as a liar. But if by way of experi-

ment he really tells them something wholly imaginary they promptly accept it as fact and perfectly all right. Only the other day a party of tourists violently disputed what I was telling them about a fish in the Aquarium, although they had to admit they did not know anything about it. The trouble is that people have a preconceived idea of "fish," and of its limitations, and do not realize the enormous plasticity of the class of fishes. In the matter of fish shapes alone, no human being, even if gifted with the imagination of an insane Doré, could conceive the vast number of weird, grotesque, or "impossible" shapes which are actually found among living fishes. If we merely named examples, whether of unusual shape, strange physiological powers as that of electricity, almost unbelievable migrations as that of the common eel, startling metamorphoses, or astonishing habits, it would require a volume.

It is true that the study of systematic ichthyology requires the use of a large, expensive and bulky collection of alcoholic specimens, and access to an exceedingly diverse and often very expensive literature, but this last item is true of all systematic work, whether botanical or zoological. But the extended study of systematic ichthyology is only one phase, and by no means always the most important one at that, of the study of fishes. The collecting of fishes in a neighborhood or limited region is not difficult or expensive and their determination is a simple matter in Europe, North America, and many other regions. But there is a vast deal to study and to learn concerning the fishes of almost every region. Not only do many fishes undergo startling transformations, but the embryology and metamorphosis of many common fishes are totally unknown. In other cases "we only know a little and that is all wrong," as has been said about another matter. The breeding habits of many fishes, both salt and fresh water, are not at all known while their study could be carried on by any one willing to devote some time to it over a series of years.

The rate of growth, the time required to reach the reproductive period, the size reached and the duration of life after sexual maturity, are all problems concerning which we are ignorant even about many very common fishes, while their solution demands only careful observation over a term of years until sufficient data are accumulated to deduce the general principles underlying them. The migrations and seasonal movements of fishes, whether due to variations in the food supply, to sexual impulses, or to climatic causes, whether latitudinal or vertical in their range, are also matters of vital importance concerning which we have yet very much to learn.

Like all other organisms, fishes are the victims of disease,

"plague, pestilence and famine," while "battle, murder and sudden death" are of course their daily lot. Parasitic fungi, protozoa, crustacea and worms make life a burden to great numbers, and some of these, as certain tapeworms, may be readily transmitted to man. Yet very little is known of fish diseases and a vast amount of valuable work may be done without any necessity for a great collection of fishes. Many fish, often in uncountable numbers, are killed by some physiological disturbance which may be due to an incalculable increase in diatoms or flagellate protozoa, or to obscure causes which as yet we can not fathom. Proper conservation of the world's natural resources, therefore, asks that work be done along these lines, and in almost any college such research could be carried on while the results would benefit the whole nation.

Biology, any science, must find its excuse for existence in the extent to which it is capable of being interpreted or translated into terms of human welfare. Judged by this standard, the study of fishes, ichthyology, pisciculture, any of its departments, is eminently worth while. The study of fishes, rightly considered and pursued, will in some one or more of its multifarious phases touch the life and affect the welfare of almost every one.

Whether it is the statesmen and scientists of Japan, nearly one third of whose redundant population derives its living from the fisheries, or Norway, striving to so husband and develop the fisheries as to permanently ensure food and a surplus for export, the professor studying the evolutionary aspects of degeneration or luminosity in fishes, or the business man who seeks the aid of ichthyologists in making his business of canning permanent by having it accord with the biological principles controlling the life history of the fishes he handles, all are alike profoundly interested in extending and perfecting our knowledge of fishes.

And is not the mountaineer with home-made tackle, or the city sportsman, or the Banks fisherman equally interested in the same thing? Yes, even though he does not always recognize or admit it. And it is the duty of the leaders of scientific education and thought to help to make him realize it.

And he, too, who gazes at fish with the eyes of artist or lover, enchanted by their marvelous variation of color and shape, and the grace and incredible speed of their movement, or it must be confessed sometimes amused by their grotesque or bizarre shapes or movements, is repaid in terms of human welfare.

Whether a human being be inspired by a poem, his emotions be transformed by the work of master musicians, or he is enraptured before a noble painting, he is certainly in contact with some-

thing which may profoundly affect human welfare, no matter how intangible or superfluous it may seem to some.

And so when one watches the incomparable beauty and grace of the living meteors that swarm about the coral reefs of the tropic seas and studies them in their environment, while the world of every-day affairs drops away from him, he is benefitted in the same way that a wonderful landscape, a perfect sunset or any work of art benefits the beholder.

We might add, too, that anything which helps to satisfy the thirst for knowledge concerning our world and all it contains is worth while, even if it served no other function.

By studying fish, we may be enabled to sustain or transform existing industries or develop new ones, thus adding enormously to the resources of society, we may throw additional or even new light upon problems of development, animal distribution and evolution, and we may help to diffuse more generally interest in and knowledge of a group of animals second only to the domestic animals in importance and, taken in connection with their setting, unsurpassed in beauty and esthetic interest.